



COMMANDERS' DIGEST

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FEDERAL CONTRACT RESEARCH CENTERS

Dependable Partners in Defense Planning





Aerospace Corporation is an FCRC whose major function has been the system engineering and technical direction of strategic missile, space and space-related efforts for DoD.

How Federal Contract Research Centers Aid DoD in the National Defense Mission

Federal Contract Research Centers (FCRCs) are a special form of nonprofit institutions which perform approximately three percent of the Department of Defense RDT&E program. DoD relies on the FCRCs for analyses and evaluations to assist in planning, for system engineering and technical direction on many systems, and for research and technology development. While there is not a clearly defined distinction between FCRCs and other nonprofits, FCRCs tend to have the following characteristics.

- They exist primarily to perform work for the Department of Defense.
- They have no commercial affiliations and undertake little or no work for private industry.
- They are usually funded by sole-source, annual contracts which implies a DoD attitude of responsibility for their continuance and stability.

• They have continuous privileged access to data of the government and industry in their fields of work (in exchange for which they accept stringent limitations upon their scope of activities and range of customers).

Present FCRCs

The Department of Defense has gradually reduced the number of FCRCs under its sponsorship to the present nine:

- Aerospace Corporation
- Analytic Services Inc. (ANSER)
- Applied Physics Laboratory (Johns Hopkins University)
- Applied Research Laboratory (Pennsylvania State University)
- Center for Naval Analyses (CNA)
- Institute for Defense Analyses (IDA)
- M.I.T. Lincoln Laboratory
- MITRE Corporation
- Rand Corporation.

The Defense Department is aware of the concern that Congress has expressed in past years with regard to FCRCs and has held discussions with the Congressional staffs concerning actions planned in relation to FCRCs. For this reason the

Directorate of Defense Research and Engineering (DDR&E) has conducted a comprehensive review and study of Defense-sponsored FCRCs to assess their continued utility, their management procedures and other aspects of their operation. The results of this effort will be available in the latter part of this calendar year.

FCRC Classification

To clarify the major functions FCRCs perform for the Department of Defense, they can be put into three categories:

- System Engineering and Technical Direction (SE/TD) Institutions

Mitre Corporation and Aerospace Corporation were established in 1958 and 1960 to support the Electronic System Division and the Space and Missile Systems Organization of the Air Force, respectively. They were organized to fill the gap in in-house organizations with extensive experience in

This article on Federal Contract Research Centers was prepared by the Director of Defense Research and Engineering for presentation to Congress as part of DoD's program of Research, Development, Test and Evaluation, FY 1976.

large system development, integration and verification. Although the Air Force is the responsible agent for both these organizations, their services are sought and used by other Military Departments.

The Mitre Corporation's DoD effort involves approximately 1,400 people. They have performed major roles in the system engineering and technical direction of almost all major Air Force command, control and communications systems during the 1960s and 1970s.

The Aerospace Corporation's DoD effort involves approximately 2,200 people whose major function has been the system engineering and technical direction of the strategic missile, space and space-related efforts for the DoD during the 1960s and 1970s.

• Studies and Analyses Institutions

Four institutions (Rand Corporation, The Institute for Defense Analyses, Analytical Services, Inc., and The Center for Naval Analyses) were established to provide objective analyses of critical Defense problems. This study and analysis support is provided by imaginative, innovative and competent staffs whose outputs give viewpoints that are independent and frequently different from those of the military staffs. These FCRCs have expertise to address the continuing problems of their sponsors in such fields as resource analysis and allocation, logistics, force structure,

training, manpower, strategic policy, etc.

The Rand Corporation's DoD effort numbers approximately 550 people. Rand efforts are directed toward long range issues and their effect on defense policy. The major users are the Air Force and the Defense Advanced Research Projects Agency (DARPA).

The Institute for Defense Analyses has approximately 350 people involved in DoD work that can best be characterized as the coupling of highly skilled scientific and professional personnel to military problems and issues of concern to the DDR&E, Defense Advanced Research Projects Agency (DARPA) and other Defense offices.

The Center for Naval Analyses has a DoD effort of approximately 360 people

principally supporting the Office of the Chief of Naval Operations. About 50 of the professionals in this group are assigned to Navy Operating Commands. Force planning, force employment, resource management, etc., are typical topics for investigation by this institution.

Analytical Services, Inc., is a relatively small organization of approximately 85 people which conducts independent studies and analyses for the Air Force staff.

• Laboratory FCRCs

These institutions are affiliated with and in some sense are extensions of universities. They were formed in the 1940s and early 1950s to undertake particularly demanding tasks involving technologies that were still confined to the universities at that time.

MIT Lincoln Laboratory has approximately 1,700 people involved in defense work.

Technical publications prepared by the Center for Naval Analyses.



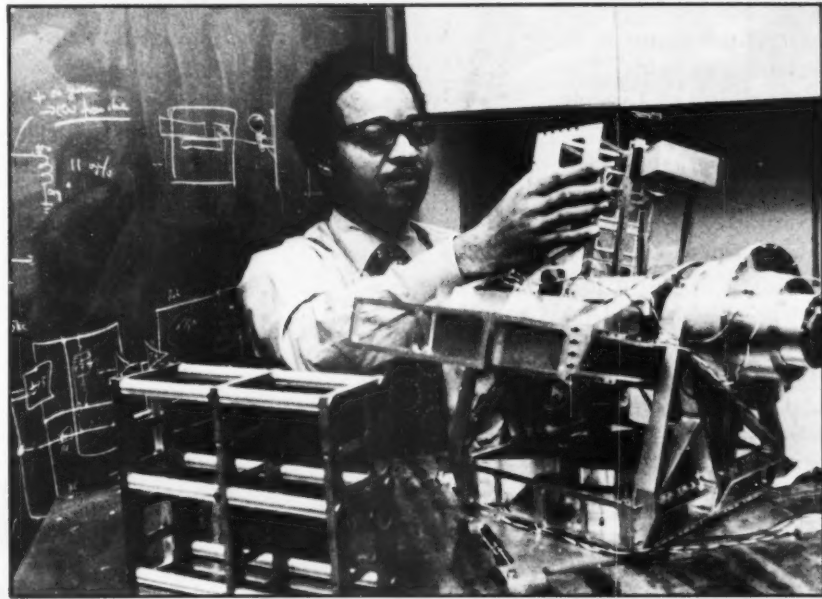
Lincoln pioneered in digital computers and air defense technology and is now engaged in fields such as missile reentry, space communications, complex measurements, lasers, radars and other aspects of electronics.

The Applied Physics Laboratory (Johns Hopkins University) has approximately 2,110 people engaged in defense work primarily for the Navy in the areas of missile systems, satellite navigation and satellite tracking systems.

The Applied Research Laboratory (Pennsylvania State University) has approximately

330 people involved in work for the Navy in the area of underwater systems, particularly torpedoes, and the related disciplines of acoustics, hydrodynamics, controls, structures and propulsion.

Using an anechoic altitude chamber, researchers at Aerospace Corporation determine what effect electrons generated by heat of reentry have on spacecraft antenna systems.



Missile launch from Vandenberg AFB, 85 miles northwest of Los Angeles, traces a "signature" in the sky above the Aerospace Corp. general office building.



- **The Continuing Need**

While FCRCs have changed their roles over the years, they have maintained leadership in areas of prime concern to their sponsors. Space and missile systems are still a major portion of defense efforts and the Aerospace Corporation is still required to support the many major programs in these important fields. The pioneering of Lincoln Laboratory in re-entry technology, missile discrimination, and space communications has placed the Department of Defense in a position of world leadership in these areas. The Department of Defense will continue to require the support of the finest studies

and analyses people in the country. The FCRCs have demonstrated the flexibility and viability to provide a reliable adjunct to in-house DoD organizations. For at least the near future, there is no possibility of acquiring these special services elsewhere.

- **Recent FCRC Accomplishments**

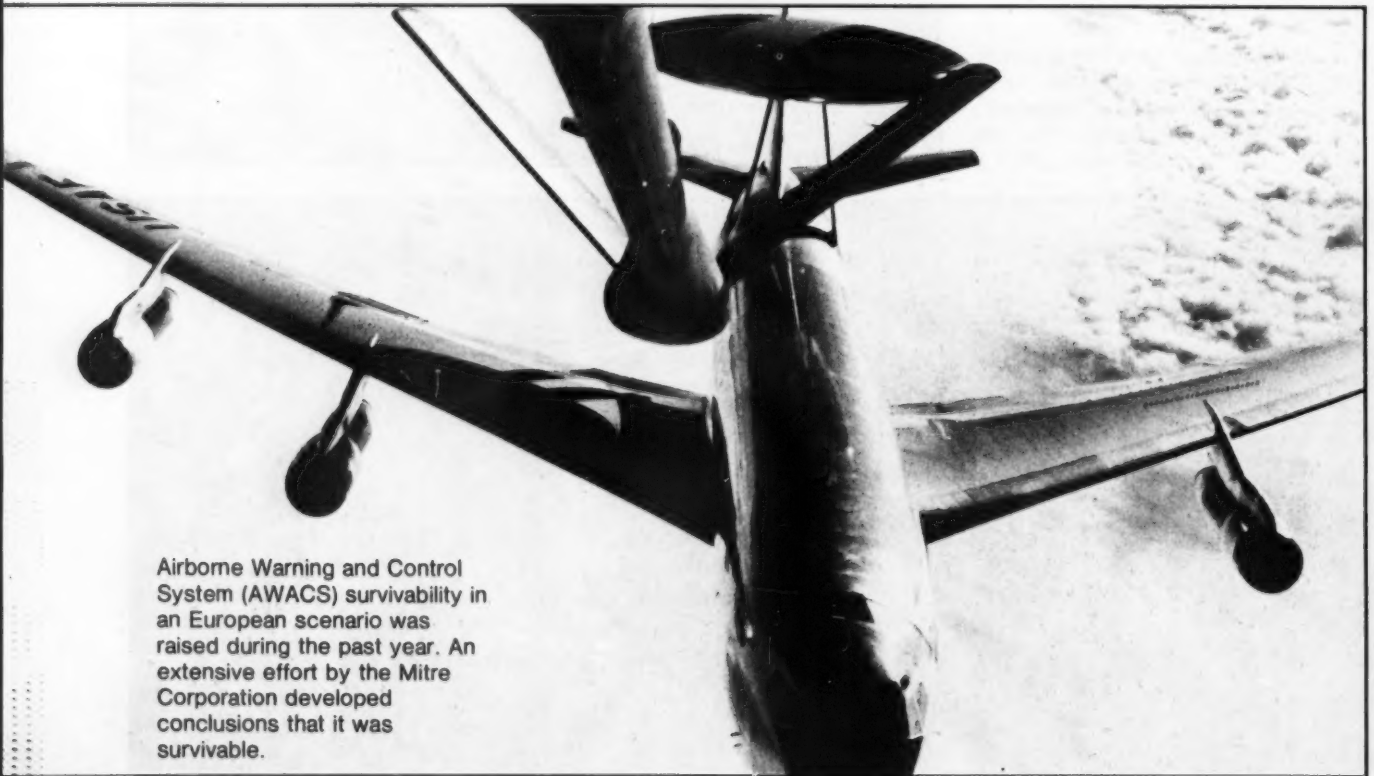
- Lincoln Laboratory completed the design of Experimental Satellites 8 & 9 (Survivable Satellite Communications System) and is now fabricating, testing and

integrating hardware for a launch this year.

- Rand Corporation made an assessment of United States vis-a-vis Soviet Union technology progress in selected areas, providing clearer understanding in an area of national importance.

- Analytical Services, Inc., conducted a study on nuclear warhead fratricide in multiround attacks to provide more realistic planning considerations.

- The critical question of the Airborne Warning and Control System (AWACS) survivability in an European scenario was raised during the past year. An intensive effort



Airborne Warning and Control System (AWACS) survivability in an European scenario was raised during the past year. An extensive effort by the Mitre Corporation developed conclusions that it was survivable.

by the Mitre Corporation developed conclusions that it was survivable. The results of Mitre's work have been widely used in NATO and the United States.

- The Aerospace Corporation developed a special program to test the operation of the Defense Support Program software against a complete spectrum of significant events. This test program has been accepted as the basis for determining



operational readiness of the software.

- The Applied Research Laboratory (Pennsylvania State University) developed and demonstrated a new concept in torpedo propulsion.

- The Applied Physics Laboratory (Johns Hopkins University) developed a method of controlling a navigation satellite so that its orbit will not have to be updated by a ground station for months.

- The Center for Naval Analyses conducted in-theater analyses relating to the United States and Soviet naval activity during the recent Middle East War.

FCRC Funding

Funding concepts for the FCRCs have remained unchanged for a number of years. Some of the FCRCs originally received the bulk of their funding from single program elements identified

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FCRCs
Line Versus Non-Line Funding
(Thousands)
FY 1976 President's Budget Request
1 January 1975

FCRC	Line	Non-Line	Total
Aerospace Corporation	11,500	66,651	78,151
Analytical Services, Inc.	1,500	854	2,354
Lincoln Laboratory	15,750	33,296	49,046
MITRE	7,450	35,247	42,697
RAND	9,000	7,390	16,390
Applied Physics Laboratory (Johns Hopkins)	—	49,782	49,782
Applied Research Laboratory (Penna. State)	—	7,140	7,140
Center for Naval Analyses	7,622	2,278	9,900
Institute for Defense Analyses	—	10,400	10,400

with each organization. The motivation was to take maximum advantage of their high technical competence by leaving the detailed program planning to the organization itself, subject to approval by the sponsors. This funding concept is similar to those used by the Army and Air Force in funding in-house laboratory technology base work.

Over the years these "line items" have been held to fixed dollar amounts or reduced through various Service and Congressional action. The amount of work that can be undertaken has declined—falling short of Service and Defense Agency needs. This has led, with Congressional approval, to

funding the FCRCs also for specific tasks on a basis similar to the industrial funding of the in-house laboratories of the Navy. The levels of FCRC funding requested in the President's budget for FY1976 in this latter category are indicated in the FCRC table.

The total allowable internal operating expenses of the FCRCs as a group is set each year by Congress with DoD given freedom to apportion this total among the FCRCs. The individual line items for each FCRC are also approved by the Congress. Although line items are now a smaller fraction of the FCRC funding and the work done therein is negotiated in more detail with the sponsoring

Service, the line item funding still provides them most of the latitude they need to operate a vigorous program. This source of funding is important to the spirit of the FCRCs and has been instrumental in many of their most successful programs.

**A New Look at the
DoD-FCRC Relationships**

The advantages of FCRCs are formidable but the Defense Department is not willing to maintain the status quo unless that turns out to be in DoD's interest. The study commissioned for CY 1975 will explore a number of aspects concerning the sponsorship of FCRCs and their operation. It will go deeply into the viability of the basic FCRC concept and will consider whether there is and will be a continuing need for the kind of services they provide. For practical purposes, this review will have to be conducted in light of the contributions and uses of each FCRC. Where there is a continuing need, DoD will evolve a long-range plan for management and control.



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